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TECHNICAL REPORT NO. 3-78

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FLIGHT PROFILE PERFORMANCE HANDBOOK

VOLUME III - AH-1G (COBRA)

Nathan H. Cleek, Jr.
Alan J. Wolfe

AUGUST 1978

DEPARTMENT OF THE ARMY
US ARMY TRADOC SYSTEMS ANALYSIS ACTIVITY
WHITE SANDS MISSILE RANGE
NEW MEXICO 88002

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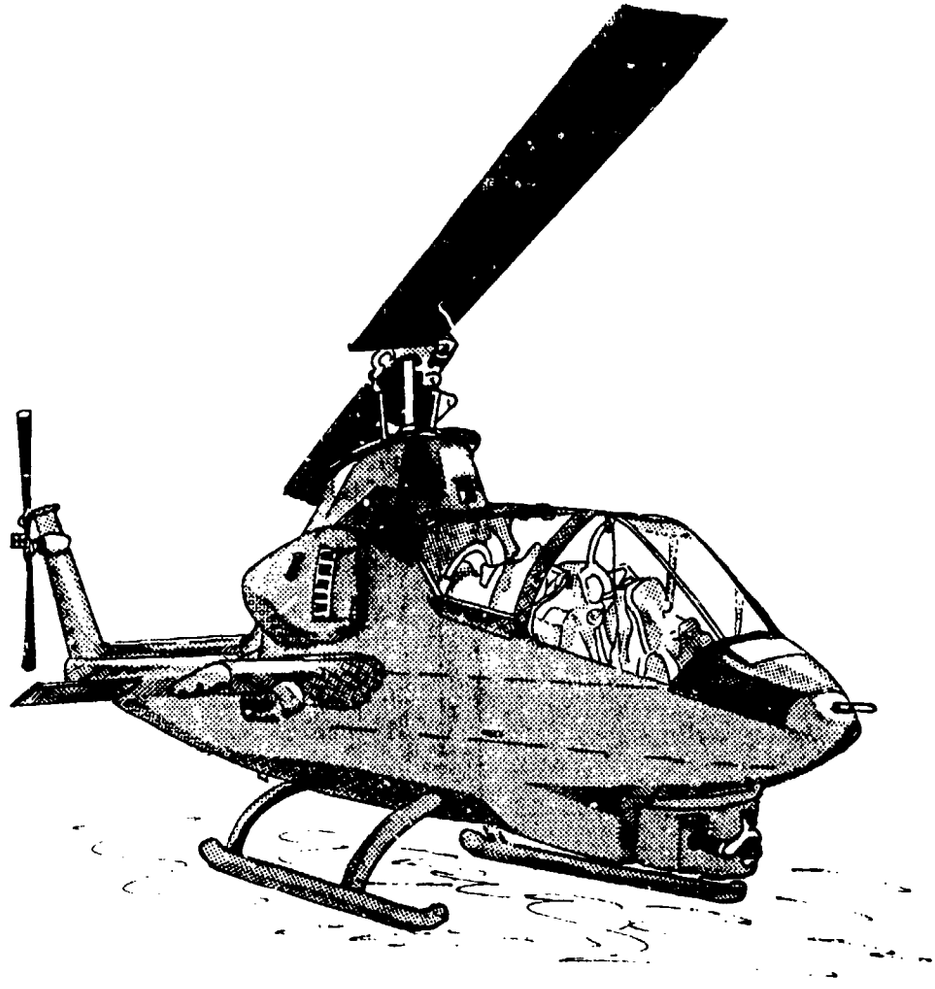

AH-1G COBRA

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CHAPTER 1

INTRODUCTION

1. PURPOSE

The purpose for preparing this handbook series is fourfold: (a) to validate AH-1G performance data quickly, (b) to reduce the manpower and time to prepare accurate flight profiles, (c) to standardize performance data so that the analysis community can benefit from a single reference in conducting studies and (d) to provide a handbook that can be used for training in the mission profile planning area.

2. BACKGROUND

The AH-1G performance data contained in this Flight Profile Performance Handbook (FPPH) series was originally acquired as a data base for the Aircraft Mission Processing Simulation (AMPS) model. AMPS is a computer program developed by the Aviation Systems Analysis Branch of the US Army TRADOC Systems Analysis Activity (TRASANA) to support Cost and Operational Effectiveness Analyses (COEAs). AMPS generates detailed flight profiles for a wide variety of helicopter missions. The data was provided TRASANA by the Army Aviation Research and Development Command (AVRADCOM) and was the most accurate data available to AVRADCOM at the time of handbook publication. In structuring the data base for AMPS it was noted that the data, when properly organized, could provide a method of doing quick and simple flight profile simulations. This volume presents the AH-1G data and explains how it can be used.

3. OBJECTIVES OF THE HANDBOOK

a. Data Validation. This volume of the handbook contains tables with the precise performance data and format required to develop flight profiles for computer simulations. Using the handbooks as a reference, the individual project manager (PM) will be able to quickly validate or update as required all associated data contained in the different tables. If this procedure is followed by the various PMs, support of Helicopter COEAs and other analyses can be efficiently implemented.

b. Flight Profile Development. Much of the manpower and time spent in preparing flight profiles for supporting aircraft COEAs is dedicated to look-up, correlation and validation of performance data. Once the procedure contained in this handbook is implemented, flight profiles can be easily prepared. What normally took one man 4 to 5 days to prepare can now be prepared in 3 to 4 hours.

c. Standardization of Performance Data. Each of the PMs has been contacted by AVRADCOM to validate the performance data contained in each handbook in this series. Once each handbook is published, the data contained will be kept current as of the publication date. Since the requests for current information are constantly being forwarded to the PMs by analysis groups, this handbook can be a reference and assure a commonality in studies within the community.

d. Training for Planning Missions and Flight Profiles. For training purposes each handbook can stand alone. It is only a matter of following the example provided and applying the proper data to fit the flight profile desired. Although the example shown is simplistic, the methodology may be expanded to apply to any flight profile no matter how complex.

4. OTHER VOLUMES

This handbook is one of a series that covers the helicopters in the US Army inventory. The complete set of handbooks and their subjects are:

Volume I - FPPH Description

Volume II - UH-60A (BLACKHAWK)

Volume III - AH-1G (COBRA)

Volume IV - AH-1S (COBRA)

Volume V - YAH-64 (Advanced Attack Helicopter [AAH])

Volume VI - OH-58C (KIOWA)

Volume VII - CH-47 (CHINOOK)

Volume VIII - CH-54 (TARHE)

Volume IX - UH-1H (HUEY)

5. GENERAL HANDBOOK DESCRIPTION

a. Performance Data. The data contained in these volumes is AH-1G performance data compiled from the results of actual experiments. It is not engineering data and is not intended to serve as a base for future helicopter construction or acquisition. The more mature the helicopter becomes, the less likely there will be a change in the basic performance data.

b. Handbook Organization. This volume is one of a series of volumes as identified in paragraph 4 above. Volume I is a description of the methodology used to develop the tables for each of the other volumes. This volume and all other volumes except Volume I provides a simplified flight profile example in Chapter 2. Chapter 3 provides an explanation of each of the five types of data tables contained in the handbook. The five types of tables deal with: (1) Basic Fuel Flow Data, (2) Delta Fuel Flow for Drag Data, (3) Ground Idle Fuel Flow Data, (4) Gross Weight Limits Data and, (5) Velocity Limits data. Chapter 4 contains the actual tables to be used for developing flight profiles.

CHAPTER 2

FLIGHT PROFILE EXAMPLE

1. GENERAL

This chapter provides an example of how to develop a flight profile, albeit simple, that can be extended to cover any number of stops, loads and distances all depending on helicopter capability and fuel available.

2. DISCUSSION

a. The main question this example of a flight profile will answer is, "Do I have enough fuel to fly the proposed mission?"

b. Suppose a pilot is to fly a simple support mission in an AH-1G helicopter that calls for flying (as shown in illustration 2-1) from point A (the air base), to point B (the holding area) to point C (the combat area) and return to A.

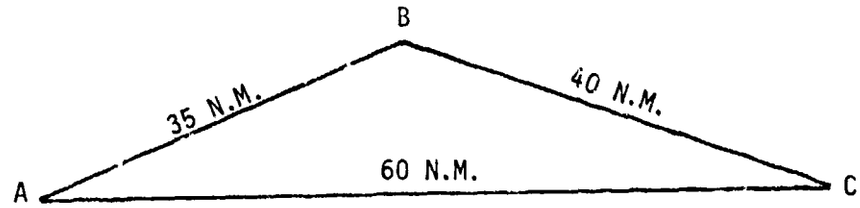


Illustration 2-1

c. The other information given is airspeed (AS) from A to B which is to be 70 knots (kts), from B to C 40 kts, and from C to A 60 kts. The AH-1G helicopter is to be flown at an ambient temperature of 15°C. The leg from A to B will be flown at 4,000 ft,* while legs B to C and C to A will be at 3,000 ft. The ground elevations at A, B and C are all 2,000 ft. The mission plan also shows 10 minutes idle at A before takeoff, 15 minutes idle at B, 20 minutes Hover in Ground Effect (HIGE) at C and 5 minutes idle on returning to A for shut-down. The AH-1G will take off with a gross weight (GW) of 9,500 lbs at A and continued to carry this weight until leaving C to return to A, then the GW will be 8,500 lbs.

All altitudes are in reference to sea level.

d. The flight plan is prepared by drawing up a table similar to Table 2-1 below. By filling in the blanks under fuel, it can be determined if the total is too large for the helicopter.

TABLE 2-1

Helicopter: AH-1G

Temperature: 15°C

LEG	DISTANCE N.M.	AS KTS	TIME MIN	TIME HR	GW LBS	ALT FT	FUEL LBS
Idle @ A	-	-	10	1/6	-	2000	
A - B	35	70	30	1/2	9500	4000	
Idle @ B	-	-	15	1/4	-	2000	
B - C	40	40	60	1	9500	3000	
HIGE @ C	-	-	20	1/3	9500	2000	
C - A	60	60	60	1	8500	3000	
Idle @ A	-	-	5	1/12	-	2000	
						Total	

e. First fill in Idle @ A, Idle @ B, and 2nd Idle @ A since they will all come from Table 2-2. In each case the idle is at 2000 ft and a temperature of 15°C. Consulting the ground idle fuel shown in Table 2-2, the value of 374 lbs/hr is at the intersection of 2000 ft and 15°C.

1st Idle @ A = 1/6 X 374 = 62 lbs

Idle @ B = 1/4 X 374 = 94 lbs

2nd Idle @ A = 1/12 X 374 = 31 lbs

TABLE 2-2

GROUND IDLE FUEL FLOW

AIRCRAFT - AH-1G

		PRESSURE ALTITUDE (FT)					
		SEA LEVEL	2000	4000	6000	8000	10000
TEMPERATURE DEGREES CENTIGRADE	-25 C	389	371	353	336	318	300
	-5 C	391	373	355	337	319	301
	15 C	391	374	356	338	321	303
	35 C	392	375	358	341	324	307

ENTRIES ARE AIRCRAFT FUEL FLOW RATES IN LBS/HR

TABLE 2-3

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 4000 FT TEMPERATURE: 15 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	495	543	496	449	431	439	469	521	623	786
7,000	519	572	517	461	439	444	475	529	635	797
7,500	544	605	540	474	449	452	482	538	649	813
8,000	570	641	565	489	461	461	491	551	664	837
8,500	599	679	593	506	475	474	503	567	683	875
9,000	629	720	623	526	491	489	518	585	707	929
9,500	661	762	656	549	510	507	536	607	736	1001

TABLE 2-4

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 2000 FT TEMPERATURE: 15 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	510	550	515	472	456	467	500	555	662	836
7,000	533	585	534	483	464	472	505	561	671	846
7,500	557	614	555	495	472	478	511	569	683	857
8,000	582	647	578	509	482	485	518	578	696	872
8,500	608	682	602	523	493	494	526	590	711	894
9,000	636	719	629	540	507	506	538	605	729	929
9,500	665	759	659	558	522	521	551	623	751	977

Notice the conversion from minutes to hours. These values must be used because fuel flow is in lbs/hr.

f. The fuel flow for leg A-B of the mission is calculated next. This leg takes place at an altitude of 4,000 ft. and a temperature of 15°C. Thus the necessary information is contained in Table 2-3. Leg A-B is at 70 kts and 9,500 lbs. This is not one of the values given but 60 kts is 510 lb/hr and 80 kts is 507 lb/hr. Interpolation gives the value of 509 lb/hr for a 70 kts airspeed. Since the leg is a half hour long:

Leg A-B = 1/2 X 509 = 255 lbs

g. Leg B-C is calculated next. Since this takes place at a 3,000 ft. altitude, it is necessary to interpolate between Table 2-3 (4,000 ft) and Table 2-4 (2,000 ft). From Table 2-3 the value for 4,000 ft, 15°C, 40 kts and 9,500 lbs is 549 lb/hr. From Table 2-4 the value for 2,000 ft, 15°C, 40 kts and 9,500 lbs is 558 lb/hr. Interpolation gives the value of 554 lb/hr for a 3,000 ft altitude. Since the leg is one hour long:

Leg B-C = 1 X 554 = 554 lbs

h. HIGE at C is calculated next. Since this occurs at 2,000 ft and 15°C the necessary value is found in Table 2-4. At 9,500 lbs, HIGE uses 665 lb/hr of fuel. Since the hover is one-third of an hour long:

HIGE @ C = 1/3 X 665 = 222 lbs

i. Leg C-A is the last calculation. Since it takes place at a 3,000 ft altitude, it is once again necessary to interpolate between values from Table 2-3 and Table 2-4. Table 2-3 gives a rate of 475 lb/hr for 4,000 ft, 15°C, 8,500 lbs and 60 kts. Table 2-4 gives a rate of 493 lb/hr for 2,000 ft, 15°C, 8,500 lbs and 60 kts. By interpolation, 484 lb/hr is the value needed. Since the leg is one hour long:

Leg C-A = 1 X 484 = 484 lbs

j. The flight profile can be finished by filling in Table 2-1 as shown in Table 2-5.

TABLE 2-5

Helicopter: AH-1G

Temperature: 15°C

LEG	DISTANCE N.M.	AS KTS	TIME MIN	TIME HR	GW LBS	ALT FT	FUEL LBS
Idle @ A	-	-	10	1/6	-	2000	62
A - B	35	70	30	1/2	9500	4000	255
Idle @ B	-	-	15	1/4	-	2000	94
B - C	40	40	60	1	9500	3000	554
HIGE @ C	-	-	20	1/3	9500	2000	222
C - A	60	60	60	1	8500	3000	484
Idle @ A	-	-	5	1/12	-	2000	31
						Total	1702

k. Although only three look-up tables were used for this example, each type of table has several conditions that are changed so that a wide band of performance parameters can be addressed. The discussion on each of the five types of tables is contained in Chapter 3. A succinct description of each of these five types of tables is:

(1) Basic Fuel Flow Data: Gives the rate the aircraft uses fuel dependent on the given flight conditions.

(2) Delta Fuel Flow for Drag Data: Gives the additional rate of fuel flow to be added to the basic rate for external drag.

(3) Ground Idle Fuel Flow Data: Gives the rate fuel is used when the aircraft is on the ground with its engine running.

(4) Gross Weight Limits Data: A check on whether or not the aircraft has enough lift to take off with a given weight.

(5) Velocity Limits Data gives the optimum (long range) speed and maximum rates of speed.

CHAPTER 3

PERFORMANCE DATA TABLE DESCRIPTIONS

1. GENERAL

This chapter describes each of the five basic type tables used for developing flight profiles. The variables within each type of table are described as well as how the specific data required can be extracted.

2. BASIC FUEL FLOW DATA

a. The basic rate of fuel flow* is determined by five variables:

(1) Type of aircraft

(2) Altitude (Air Pressure)**

(3) Temperature***

(4) Gross Weight****

(5) Flight Mode

b. In each table (see Table 3-1) within the basic type, the first three variables are held constant for the whole table, i.e., (a) Type of Aircraft, (b) Altitude (Air Pressure) above sea level, and (c) Temperature. These variables are stated at the top of each table.

c. There are seven rows of fixed gross weights: 6,500 lbs to 9,500 lbs inclusive at 500 lb increments. The ten columns are fixed flight modes.

(1) The first column is Hover In Ground Effect (HIGE). HIGE is used for hovers at a height of 2 feet or less and a component of forward flight 10 kts or less.

(2) The second column is Hover Out of Ground Effect (HOGE). This is used for hovers at a height of more than 2 feet.

---

*The basic fuel flow data represents a clean drag configuration with all doors closed, no wing stores, and no external sling loads.

**All altitudes or air pressures are feet above sea level.

***For simplicity, all temperatures are considered to be the average temperature in which the helicopter is operating (Degrees Centigrade).

****Total vehicle weight in pounds.

(3) The third column is Nap of the Earth (NOE). This is defined as all flight for variable speeds from 0 to 40 kts and variable altitudes.

(4) The remaining seven columns are for given airspeeds* (in kts) as the flight mode.

d. There are 24 of these basic fuel flow charts. Each chart is for a different combination of Air Pressure (Altitude) and temperature.

e. The Basic Fuel Flow Data is the main table used in simulating a flight profile. For example, assume a pilot's flight path will require 30 minutes of flight at 80 kts airspeed, 4000 ft. altitude, 15°C and a gross weight of 8,000 lbs in a AH-1G helicopter. Using Table 3-1 at a gross weight of 8,000 lbs and an airspeed of 80 kts, the helicopter will use 461 lbs/hr fuel, i.e., for 30 minutes, 231 lbs of fuel will be used.

f. The gross weights values selected provide the basic range of load carrying capability for the ten flight modes of the AH-1G helicopter. Within the gross weight band shown, linear interpolation** is quite accurate for estimating the fuel flow rates.

g. For example, using Table 3-1, if the helicopter's gross weight was 7,750 lbs and if the flight mode was 60 kts, the fuel flow cannot be found directly. But by interpolating between 60 kts, 7,500 lbs - 449 lbs/hr and 8,000 lbs - 461 lbs/hr, the basic fuel flow rate for 7,750 lbs is 455 lbs/hr. In this example, if the helicopter flies in this mode for 30 minutes, 228 lbs of fuel will be used.

h. As altitude and/or temperature changes occur, different tables are used to look up the aircraft's basic fuel flow rate for each leg of the flight path. Care must be taken that the proper table is used.

i. Appendix A contains a set of functions that will give a good approximation of the basic rate of fuel flow.

3. DELTA FUEL FLOW FOR DRAG DATA

a. The delta fuel flow for drag is also determined by five variables:

(1) Type of Aircraft

(2) Altitude (Air Pressure)

(3) Temperature

(4) Drag Surface (Equivalent Square Footage)

(5) Air Speed

All references to airspeeds are to true airspeeds.

***All references to interpolation are linear interpolations. See FPPH, Volume I, Chapter 3 for a discussion on the accuracy of interpolation.*

TABLE 3-1

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 4000 FT TEMPERATURE: 15 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	495	543	496	449	431	439	469	521	623	786
7,000	519	572	517	461	439	444	475	529	635	797
7,500	544	605	540	474	449	452	482	538	649	813
8,000	570	641	565	489	461	461	491	551	664	837
8,500	599	679	593	506	475	474	503	567	683	875
9,000	629	720	623	526	491	489	518	585	707	929
9,500	661	762	656	549	510	507	536	607	736	1001

TABLE 3-2

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 4000 FT TEMPERATURE: 15 C

AIRCRAFT - AH-1G

		AIR SPEED IN KTS						
		40	60	80	100	120	140	160
DRAG IN SQUARE FEET	5.0	1	4	9	17	31	57	91
	10.0	2	7	17	34	64	116	190

b. Like the basic fuel flow tables, there are 24 tables for delta fuel flow for drag.

c. There are two fixed rows of equivalent square feet of drag: 5.0 equivalent sq ft and 10.0 equivalent sq ft.

d. The seven columns are for airspeeds in kts of: 40 kts, 60 kts, 80 kts, 100 kts, 120 kts, 140 kts, and 160 kts.

e. When an external load is placed on the helicopter, the amount of fuel consumed per hour increases. The delta fuel flow for drag tables indicate how much extra fuel consumption to add to the basic fuel flow rate.

f. In the example given earlier, a 30 minute flight at 80 kts airspeed, 4000 ft altitude, 15°C and a gross weight of 8,000 lbs was used. Using the basic fuel flow tables, the basic fuel flow rate was 461 lbs/hr. Assuming for this new example that part of the load is external and inducing a 5.0 equivalent sq ft external drag, the delta fuel flow for drag (Table 3-2) shows 9 lbs/hr should be added to the basic fuel flow rate. Thus the basic fuel flow rate becomes 461 + 9 or 470 lbs per hour and for a half-hour flight, 235 lbs of fuel will be used instead of the 231 lbs figured without an external load.

g. Appendix B contains a function that will give a good approximation of the delta fuel flow for drag.

4. GROUND IDLE FUEL FLOW DATA

a. The ground idle fuel flow rate is determined by only three variables:

(1) Type of Aircraft

(2) Altitude (Air Pressure)

(3) Temperature

b. There is only one ground idle fuel flow table (shown as Table 2-2). The table has four rows of temperatures: -25°C, -5°C, 15°C and 35°C, and six columns of altitudes: Sea Level, 2000 ft, 4000 ft., 6000 ft., 8000 ft., and 10000 ft.

c. The ground idle fuel flow table is used as discussed in the example flight profile in Chapter 2 (Table 2-2). The AH-1G helicopter idling for 20 minutes at 2000 ft. altitude and 15°C, (across the row labeled 15°C and down the column labeled 2000) find the intersection at 374. Thus, the AH-1G uses 374 lbs/hr at these conditions and since it is idling for 20 minutes or 1/3 of an hour, it will use 125 lbs of fuel.

d. If the helicopter had only been 1000 ft. above sea level, the consumption rate would be found by interpolating between the sea level rate of 391 lbs/hr and the 2000 ft. rate of 374 lbs/hr which would be 383 lbs/hr. In 1/3 of an hour 128 lbs of fuel would be used.

e. Appendix C contains a function that will give a good approximation of the ground idle fuel flow.

5. GROSS WEIGHT LIMITS DATA

a. Gross weight limits tables are intended to show whether or not the aircraft can safely take off for four sets of criteria. These criteria are defined in the following paragraphs:

(1) Criteria #1 is based on the helicopter using 100% of Maximum Power for take off and having enough power to lift straight up and above ground effect (See Figure 3-1). Once it is in hovering above ground effect level the helicopter begins forward flight until it acquires, transitional lift and is able to climb at 450 ft/min (a desired standard rate of climb) to the desired altitude. This criteria has some risk since the pilot has no reserve power. It has less risk than Criteria #3 but more than Criteria #2 thus it is considered to be "Middle of the Road" risk.

(2) Criteria #2 (Figure 3-1) is based on the helicopter using 95% of Maximum Power for take off and enough power to immediately begin to climb at a rate of 450 ft/min. This is the least risky criteria since the pilot has power in reserve and is still able to climb at a satisfactory rate.

(3) Criteria #3 (Figure 3-1) has the most risk. Using 100% of Maximum Power the helicopter will only hover in ground effect. Therefore, at an altitude of 2 feet or less, the pilot must begin forward flight and gradually increase airspeed to acquire transitional lift to climb. The reasons for its high risk are readily apparent. First, there is no power in reserve. Second, the pilot must begin forward flight at a very low altitude.

(4) Criteria #4. Structural Gross Weight Limits is the total upper limit of gross weight the helicopter can carry under any take off criteria.

b. Gross Weight Limits are determined by four variables:

(1) Type of Aircraft

(2) Criteria Chosen

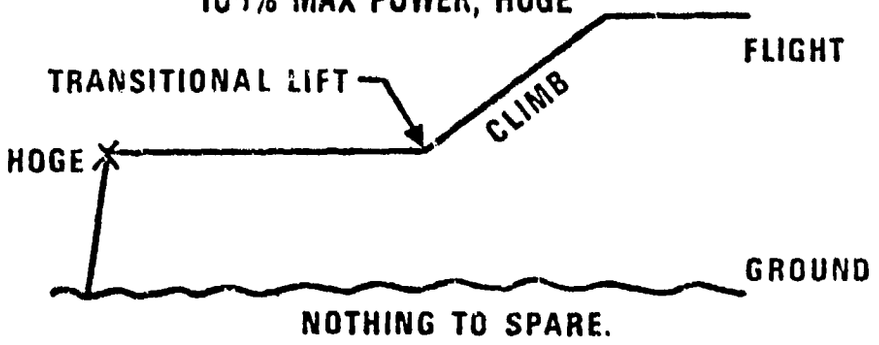
(3) Altitude (Air Pressure)

(4) Temperature

CRITERIA #1

(MIDDLE OF THE ROAD)

100% MAX POWER, HOGE

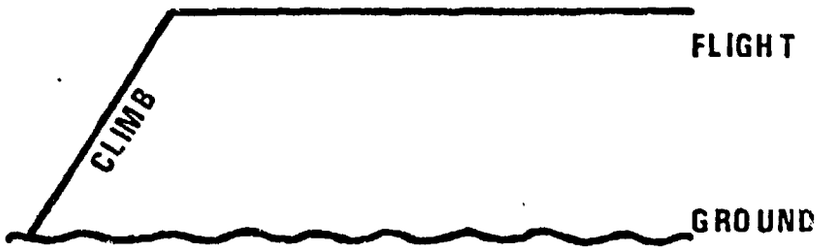


NOTHING TO SPARE.

CRITERIA #2

(LEAST RISKY)

95% OF RATED POWER. VERTICAL RATE OF CLIMB 450 FT/MIN, HOGE

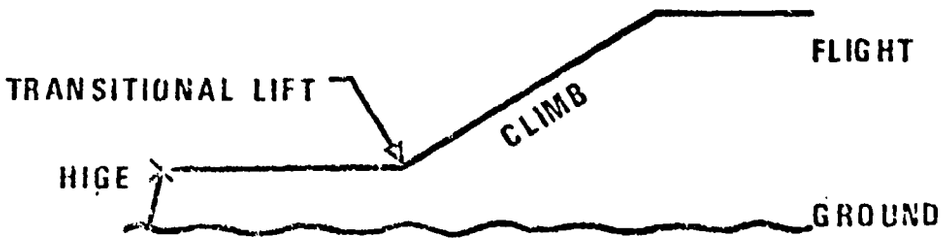


POWER LEFT

CRITERIA #3

(MOST RISKY)

100% MAX POWER, HIGE



NOTHING TO SPARE.

Figure 3-1

c. Additionally, Criteria #1, #2, and #3 differ due to engine power limits or transmission power limits of the aircraft. Thus there are six tables:

(1) Criteria #1 (Due to engine)

(2) Criteria #1 (Due to transmission)

(3) Criteria #2 (Due to engine)

(4) Criteria #2 (Due to transmission)

(5) Criteria #3 (Due to engine)

(6) Criteria #3 (Due to transmission)

d. The structural gross weight limit is a single value for each helicopter and is only dependent on the type helicopter. The AH-1G structural gross weight limit is given as 9,500 lbs and is listed at the bottom of each table. As the name implies, it is simply not safe to expect the AH-1G structure to maneuver normally when the total weight is larger than that value.

e. In simulating inflight profile, the gross weight limits tables are used to check whether the aircraft is going to be too heavy to take off under the given conditions. As an example, assume an AH-1G pilot planned a mission that called for using take off criteria #1 and the take off was to be at 6000 ft., 15°C, and a gross weight of 8,300. Three checks would be required: First, does this gross weight exceed the structural gross weight limit? Second, does it exceed Criteria #1 (due to transmission)? Third, does it exceed Criteria #1 (due to engine)? In the example given, the answer to all three questions is "No", the take off will not exceed aircraft limits. (Tables 3-3 and 3-4)

f. If the assigned gross weight had been 8,500 lbs, it would have exceeded the value given for 6,000 ft. and 15°C at Criteria #1 (Due to engine). (Table 3-3) The mission could not be flown as planned. The plan could be changed, for example to take off at 4000 ft. (which might not be practical) or change to take off Criteria #3 (which is more risky but has higher limits).

g. If the assigned gross weight had been 9,700 lbs., it would have exceeded the structural limits. To perform the mission the only choices would be to lighten the load or get another type helicopter.

h. Appendix D contains a set of functions that will give a good approximation of the gross weight limits for takeoff.

TABLE 3-3

GROSS WEIGHT LIMITS
(DUE TO ENGINE)
FOR TAKEOFF CRITERIA #1
100% OF MAXIMUM POWER (HOGE)
AIRCRAFT - AH-1G

		PRESSURE ALTITUDE (FT)					
		SEA LEVEL	2000	4000	6000	8000	10000
TEMPERATURE DEGREES CENTIGRADE	-25 C	13521	12582	11704	10856	10063	9322
	-5 C	12128	11275	10440	9699	8958	8561
	15 C	10514	9762	9019	8338	7708	7038
	35 C	8766	8143	7530	6962	6394	5908

ENTRIES ARE AIRCRAFT GROSS WEIGHTS IN LBS

STRUCTURAL GROSS WEIGHT LIMIT: 9,500 LBS

TABLE 3-4

GROSS WEIGHT LIMITS
(DUE TO TRANSMISSION)
FOR TAKEOFF CRITERIA #1
100% OF MAXIMUM POWER (HOGE)
AIRCRAFT - AH-1G

		PRESSURE ALTITUDE (FT)					
		SEA LEVEL	2000	4000	6000	8000	10000
TEMPERATURE DEGREES CENTIGRADE	-25 C	9820	9632	9440	9251	9061	8865
	-5 C	9618	9431	9245	9058	8866	8660
	15 C	9433	9250	9066	8877	8676	8449
	35 C	9264	9083	8897	8700	8481	8229

ENTRIES ARE AIRCRAFT GROSS WEIGHTS IN LBS

STRUCTURAL GROSS WEIGHT LIMIT: 9,500 LBS

6. VELOCITY LIMITS DATA

a. There are various types of data given in these tables but like the gross weight limits tables, they are primarily restraints on what can be expected of a helicopter in planning a mission profile. Velocity limits tables are influenced by five variables:

(1) Type of aircraft

(2) Air pressure (altitude)

(3) Temperature

(4) Gross weight

(5) Condition or limit

b. Items (1) through (4) are self-explanatory. There are five types of information that can be listed under (5):

(1) Long range

(2) Maximum continuous power

(3) Maximum power (due to engine limits)

(4) Transmission limits

(5) V_{ne} (velocity never exceed)

c. For each aircraft, there are 24 Velocity Limits Tables depending on air pressure and temperature combination. Table 3-5 is an example of the content of the Velocity Limits Table.

d. The two columns under Long Range (Table 3-5) give the optimum speed and fuel flow for each set of variables #1 through #4 above. Thus the AH-1G helicopter operating at 2000 ft., temperature 15°C, and having a gross weight of 8,000 lbs will fly a longer distance if the velocity is kept at 132 kts and will use 642 lbs/hr of fuel at that velocity.

e. Maximum continuous power gives the fastest speed at which a helicopter can fly for long periods (30 minutes or more) and the associated fuel flow rate. An example from Table 3-5 would be an AH-1G helicopter at 2000 ft. and 15°C weighing 8,000 lbs could fly 144 kts with a fuel usage of 731 lbs/hr.

TABLE 3-5

VELOCITY LIMITS TABLE
(INCLUDING FUEL FLOW RATES)
PRESSURE: 2000 FT TEMPERATURE: 15 C
AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	LONG RANGE		MAX CONTINUOUS POWER		MAX POWER (ENGINE)		TRANSMISSION LIMITS		VELOCITY NEVER EXCEED	
	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)
6,500	134	626	149	731	154	781	150	739	187	1109
7,000	134	632	148	731	153	781	148	739	187	1116
7,500	133	635	146	731	152	781	147	739	187	1125
8,000	132	642	144	731	150	781	145	739	187	1143
8,500	132	654	142	731	148	781	143	739	187	1180
9,000	132	670	140	731	146	781	141	739	187	1252
9,500	132	690	137	731	143	781	138	739	187	1353

f. Maximum power (engine and transmission limits) show the maximum speeds the aircraft can structurally attain for short periods of time (less than 30 minutes). Thus the AH-1G helicopter at 2000 ft and 15°C weighing 8,000 lbs has an engine that is capable of producing enough power to fly 150 kts but the transmission limits the aircraft to 145 kts. Between these two columns then, the flight cannot exceed 145 kts with a fuel flow rate of 739 lbs/hr.

g. There is another limiting factor called V_{ne} (velocity never exceed). This velocity limit is determined by helicopter structural considerations. V_{ne}'s for the AH-1G are used as limits. That is, the structure limits the aircraft to that maximum velocity.

7. DETAILED FLIGHT PROFILE USING ALL PERFORMANCE DATA TABLES

The example of a Flight Profile in Chapter 2 was intentionally simplified to assure clarity. The description of the various tables in this handbook, however, indicates a more complex set of considerations are normally encountered in developing the flight profile. With the description provided in this chapter, additional information should be included in the flight plan beyond that shown in the example and a suggested format is provided below in Table 3-6.

TABLE 3-6

Helicopter:
Altitude:
Temperature:

LEG	DISTANCE	AS	CHECK VELOCITY LIMIT	TIME	GW (LBS)	DRAG	FUEL

Needed for each take off:
Weight at take off:
Type of take off:
Check transmission limits:
Check engine limits:
Check structural gross weight limit:

CHAPTER 4

COBRA (AH-1G) PERFORMANCE DATA TABLES

GENERAL

The following tables are the major information presented in this handbook. If the procedure for using them is understood, a flight profile for the COBRA (AH-1G) helicopter can be prepared in a matter of a few hours. The performance data contained have been reviewed for accuracy and are corrected to the best of our knowledge. The tables are organized in the following manner:

Tables 4-1 to 4-24	Basic Fuel Flow Data
Tables 4-25 to 4-48	Delta Fuel Flow for Drag Data
Table 4-49	Ground Idle Fuel Flow Data
Tables 4-50 to 4-55	Gross Weight Limits Data
Tables 4-56 to 4-79	Velocity Limits Data

BASIC FUEL FLOW DATA

TABLES

TABLE 4-1

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: SEA LEVEL TEMPERATURE: -25 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	494	549	517	485	478	501	553	637	804	1098
7,000	515	573	534	495	485	508	559	644	817	1123
7,500	538	598	552	505	492	514	566	652	832	1148
8,000	560	624	570	516	500	520	571	660	847	1173
8,500	584	652	590	528	508	526	578	669	865	1199
9,000	609	682	611	540	517	533	585	679	884	1225
9,500	635	716	634	553	526	540	593	691	905	1255

TABLE 4-2

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: SEA LEVEL TEMPERATURE: -5 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	511	564	527	491	480	497	540	608	740	956
7,000	533	587	544	501	486	503	545	614	749	972
7,500	555	612	562	512	494	509	550	620	759	989
8,000	578	639	581	523	501	514	556	627	771	1005
8,500	603	670	602	535	510	520	562	636	784	1024
9,000	628	702	625	548	520	527	569	646	799	1046
9,500	655	738	650	562	531	536	578	658	816	1073

TABLE 4-3

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: SEA LEVEL TEMPERATURE: 15 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	527	577	537	498	484	497	533	591	704	889
7,000	549	601	554	508	491	503	538	597	712	900
7,500	572	627	573	519	498	508	543	603	721	909
8,000	595	656	594	531	507	513	549	610	733	920
8,500	620	688	616	544	516	520	555	620	746	935
9,000	646	723	641	558	527	529	564	631	761	955
9,500	674	760	667	574	540	540	574	645	778	985

TABLE 4-4

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: SEA LEVEL TEMPERATURE: 35 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	542	590	548	506	490	499	529	577	670	818
7,000	565	615	566	516	497	504	533	582	676	824
7,500	588	643	586	528	505	509	538	588	685	831
8,000	612	674	607	541	514	515	543	595	694	841
8,500	637	708	631	555	525	523	551	604	706	858
9,000	664	743	657	571	538	534	561	616	719	883
9,500	692	781	685	589	552	548	573	631	736	919

TABLE 4-5

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 2000 FT TEMPERATURE: -25 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	479	533	496	460	450	472	520	599	760	1044
7,000	501	557	514	470	458	473	526	606	774	1069
7,500	524	583	532	481	465	484	532	615	790	1094
8,000	548	612	552	493	474	490	539	624	807	1119
8,500	573	643	574	505	483	497	546	635	827	1147
9,000	600	678	598	519	493	505	555	647	850	1178
9,500	628	715	624	534	504	514	564	663	875	1215

TABLE 4-6

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 2000 FT TEMPERATURE: -5 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	495	546	506	466	452	468	507	571	696	904
7,000	517	571	523	476	459	473	512	577	706	920
7,500	541	598	543	488	467	479	518	584	718	937
8,000	565	629	564	500	476	485	524	593	732	956
8,500	591	662	588	513	486	492	532	603	747	979
9,000	618	699	613	528	497	501	541	616	765	1009
9,500	647	737	641	544	511	513	552	632	787	1049

TABLE 4-7

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 2000 FT TEMPERATURE: 15 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	510	558	515	472	456	467	500	555	662	836
7,000	533	585	534	483	464	472	505	561	671	846
7,500	557	614	555	495	472	478	511	569	683	857
8,000	582	647	578	509	482	485	518	578	696	872
8,500	608	682	602	523	493	494	526	590	711	894
9,000	636	719	629	540	507	506	538	605	729	929
9,500	665	759	659	558	522	521	551	623	751	977

TABLE 4-8

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 2000 FT TEMPERATURE: 35 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	525	571	528	480	462	468	495	541	629	766
7,000	548	600	545	491	470	473	500	547	637	773
7,500	572	631	568	504	479	480	506	554	647	784
8,000	597	665	592	519	490	489	514	564	659	802
8,500	624	701	618	535	504	500	524	577	673	830
9,000	653	739	647	554	519	514	537	592	690	869
9,500	684	780	678	576	537	530	553	611	714	923

TABLE 4-9

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 4000 FT TEMPERATURE: -25 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	465	518	477	437	425	444	489	563	719	993
7,000	488	544	496	448	433	450	495	572	735	1018
7,500	512	572	516	459	441	456	501	581	752	1043
8,000	538	604	538	472	450	463	509	592	773	1071
8,500	565	640	563	486	461	471	518	605	796	1104
9,000	593	678	590	501	473	481	528	622	823	1143
9,500	623	717	618	519	487	494	541	644	853	1193

TABLE 4-10

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 4000 FT TEMPERATURE: -5 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	480	530	488	442	427	439	476	536	656	855
7,000	504	558	506	454	435	445	481	543	668	871
7,500	528	588	527	466	443	451	488	552	682	890
8,000	554	622	551	479	454	459	495	563	698	915
8,500	582	660	577	495	466	469	505	577	717	947
9,000	611	695	605	512	480	481	517	593	739	991
9,500	642	740	636	531	496	497	533	614	766	1048

TABLE 4-11

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 4000 FT TEMPERATURE: 15 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	495	543	496	449	431	439	469	521	623	786
7,000	519	572	517	461	439	444	475	529	635	797
7,500	544	605	540	474	449	452	482	538	649	813
8,000	570	641	565	489	461	461	491	551	664	837
8,500	599	679	593	506	475	474	503	567	683	875
9,000	629	720	623	526	491	489	518	585	707	929
9,500	661	762	656	549	510	507	536	607	736	1001

TABLE 4-12

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 4000 FT TEMPERATURE: 35 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	509	557	507	456	436	440	464	508	592	718
7,000	533	588	529	469	446	446	470	515	602	729
7,500	559	622	553	484	457	455	479	525	613	748
8,000	586	659	580	501	471	467	489	539	628	778
8,500	615	698	609	520	487	482	503	555	647	821
9,000	646	740	642	544	505	499	520	574	673	882
9,500	679	785	678	572	526	518	542	599	709	977

TABLE 4-13

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 6000 FT TEMPERATURE: -25 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	453	505	460	416	402	418	459	530	682	945
7,000	477	534	480	427	410	424	466	540	700	970
7,500	503	566	503	440	419	431	473	551	720	998
8,000	530	602	528	454	430	439	482	565	744	1032
8,500	559	641	555	470	443	450	494	583	772	1074
9,000	590	680	584	488	458	464	508	606	804	1128
9,500	623	721	615	509	479	481	525	633	841	1195

TABLE 4-14

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 6000 FT TEMPERATURE: -5 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	488	518	469	421	403	413	447	504	620	809
7,000	492	549	491	433	412	419	453	513	634	828
7,500	519	583	515	447	423	427	461	524	650	853
8,000	546	621	542	463	435	438	471	539	670	888
8,500	576	661	571	480	450	451	484	556	693	935
9,000	608	702	601	501	467	467	500	578	722	998
9,500	642	744	635	526	486	486	521	603	757	1078

TABLE 4-15

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 6000 FT TEMPERATURE: 15 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	481	531	480	428	407	412	441	491	589	740
7,000	507	564	503	441	418	420	448	500	603	756
7,500	533	600	528	456	430	430	457	513	619	781
8,000	562	639	556	474	444	443	470	530	639	822
8,500	593	680	587	494	461	459	486	549	664	881
9,000	625	723	621	519	480	477	506	572	696	961
9,500	661	768	659	550	503	498	531	602	739	1077

TABLE 4-16

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 6000 FT TEMPERATURE: 35 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	495	546	491	436	414	414	437	478	558	677
7,000	520	580	515	451	425	423	445	488	570	696
7,500	548	617	542	468	439	436	456	502	585	727
8,000	577	657	572	488	456	451	470	519	606	774
8,500	609	700	606	512	474	468	489	539	633	842
9,000	643	746	645	543	497	489	513	567	676	958
9,500	680	799	692	585	526	517	546	610	747	1156

TABLE 4-17

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 8000 FT TEMPERATURE: -25 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	443	495	446	396	380	393	432	501	649	900
7,000	469	528	468	409	390	400	440	512	670	928
7,500	496	564	494	424	401	409	449	526	694	963
8,000	526	603	522	440	414	420	461	546	723	1008
8,500	557	643	551	459	429	435	476	570	756	1065
9,000	590	685	583	481	448	452	495	598	795	1139
9,500	624	731	619	507	469	473	518	630	842	1231

TABLE 4-18

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 8000 FT TEMPERATURE: -5 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	457	509	456	402	382	389	420	476	588	768
7,000	483	544	480	416	393	397	428	487	604	794
7,500	511	582	507	432	405	408	439	502	625	830
8,000	541	622	536	450	421	422	453	521	649	881
8,500	574	664	568	472	438	439	470	543	679	948
9,000	609	707	603	498	459	458	492	570	718	1037
9,500	644	756	644	531	483	482	520	604	774	1164

TABLE 4-19

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 8000 FT TEMPERATURE: 15 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	470	524	467	409	387	389	415	464	559	701
7,000	497	560	492	425	400	400	425	477	575	727
7,500	526	599	521	442	414	413	438	494	596	771
8,000	557	641	552	464	432	430	455	514	623	834
8,500	591	684	587	490	452	448	476	539	657	922
9,000	627	732	628	524	476	472	504	573	708	1062
9,500	664	790	680	570	509	504	543	627	796	1285

TABLE 4-20

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 8000 FT TEMPERATURE: 35 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	483	539	478	418	394	392	412	453	529	646
7,000	511	576	505	435	409	405	424	467	544	678
7,500	540	616	538	456	425	421	439	484	565	727
8,000	573	660	576	481	445	439	458	505	596	802
8,500	607	707	611	515	469	461	485	537	646	943
9,000	645	763	663	562	502	494	523	585	732	1168
9,500	684	828	726	624	552	544	583	672	888	1442

TABLE 4-21

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 10000 FT TEMPERATURE: -25 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	435	490	435	379	361	371	407	474	621	861
7,000	463	527	460	394	372	380	417	489	646	896
7,500	492	566	488	411	386	391	429	510	675	943
8,000	524	606	518	430	402	407	445	535	710	1004
8,500	558	649	551	454	421	425	465	564	751	1083
9,000	592	697	589	482	444	447	490	597	802	1184
9,500	628	748	633	517	470	473	523	639	867	1323

TABLE 4-22

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 10000 FT TEMPERATURE: -5 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	448	505	445	386	364	368	397	451	560	736
7,000	477	543	472	401	377	379	408	467	581	773
7,500	507	584	502	420	393	393	422	486	606	826
8,000	540	625	534	443	411	411	440	509	638	899
8,500	575	670	571	472	433	432	464	538	682	997
9,000	611	723	616	509	459	458	496	577	747	1151
9,500	649	784	671	559	495	494	540	636	851	1389

TABLE 4-23

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 10000 FT TEMPERATURE: 15 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	461	520	457	394	370	370	394	442	533	675
7,000	490	559	486	412	385	384	407	460	554	720
7,500	522	601	518	434	403	401	424	480	582	1787
8,000	556	645	553	462	424	421	447	507	620	884
8,500	593	696	598	499	451	446	478	546	679	1050
9,000	630	758	654	551	489	485	525	610	791	1299
9,500	670	825	721	618	535	544	595	704	971	1593

TABLE 4-24

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 10000 FT TEMPERATURE: 35 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	FLIGHT MODE (KTS)									
	HIGE	HOGE	NOE	40	60	80	100	120	140	160
6,500	474	534	469	404	379	376	393	433	505	629
7,000	504	575	500	425	396	391	408	450	526	680
7,500	536	619	535	451	416	410	429	473	559	763
8,000	572	669	578	488	441	434	457	505	616	925
8,500	619	728	634	539	480	472	502	570	721	1170
9,000	650	795	701	606	538	531	572	664	906	1457
9,500	694	872	780	688	617	613	665	793	1152	1774

DELTA FUEL FLOW FOR DRAG DATA

TABLES

TABLE 4-25

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: SEA LEVEL TEMPERATURE: -25 C

AIRCRAFT - AH-1G

		AIR SPEED IN KTS						
		40	60	80	100	120	140	160
DRAG IN SQUARE FEET	5.0	1	5	12	24	46	80	134
	10.0	3	10	23	49	9.	165	268

TABLE 4-26

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: SEA LEVEL TEMPERATURE: -5 C

AIRCRAFT - AH-1G

		AIR SPEED IN KTS						
		40	60	80	100	120	140	160
DRAG IN SQUARE FEET	5.0	1	4	11	21	40	74	122
	10.0	3	9	22	43	82	148	246

TABLE 4-27

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: SEA LEVEL TEMPERATURE: 15 C

AIRCRAFT - AH-1G

		AIR SPEED IN KTS						
		40	60	80	100	120	140	160
DRAG IN SQUARE FEET	5.0	1	4	10	20	36	64	104
	10.0	2	8	20	39	73	133	217

TABLE 4-28

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: SEA LEVEL TEMPERATURE: STD C

AIRCRAFT - AH-1G

		AIR SPEED IN KTS						
		40	60	80	100	120	140	160
DRAG IN SQUARE FEET	5.0	1	4	9	18	32	57	97
	10.0	2	7	18	37	65	117	193

TABLE 4-29

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 2000 FT TEMPERATURE: -25 C

AIRCRAFT - AH-1G

		AIR SPEED IN KTS						
		40	60	80	100	120	140	160
DRAG IN SQUARE FEET	5.0	1	5	11	22	43	74	125
	10.0	3	9	22	46	88	154	249

TABLE 4-30

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 2000 FT TEMPERATURE: -5 C

AIRCRAFT - AH-1G

		AIR SPEED IN KTS						
		40	60	80	100	120	140	160
DRAG IN SQUARE FEET	5.0	1	4	10	20	38	69	114
	10.0	2	8	20	40	77	137	230

TABLE 4-31

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 2000 FT TEMPERATURE: 15 C

AIRCRAFT - AH-1G

		AIR SPEED IN KTS						
		40	60	80	100	120	140	160
DRAG IN SQUARE FEET	5.0	1	4	9	18	33	80	97
	10.0	2	8	18	37	68	124	203

TABLE 4-32

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 2000 FT TEMPERATURE: 35 C

AIRCRAFT - AH-1G

		AIR SPEED IN KTS						
		40	60	80	100	120	140	160
DRAG IN SQUARE FEET	5.0	1	3	8	17	30	53	90
	10.0	2	7	17	34	61	109	180

TABLE 4-33

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 4000 FT TEMPERATURE: -25 C

AIRCRAFT - AH-1G

		AIR SPEED IN KTS						
		40	60	80	100	120	140	160
DRAG IN SQUARE FEET	5.0	1	4	10	21	40	70	116
	10.0	3	9	20	43	83	145	232

TABLE 4-34

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 4000 FT TEMPERATURE: -5 C

AIRCRAFT - AH-1G

		AIR SPEED IN KTS						
		40	60	80	100	120	140	160
DRAG IN SQUARE FEET	5.0	1	4	9	19	35	64	107
	10.0	2	8	19	38	72	128	214

TABLE 4-35

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 4000 FT TEMPERATURE: 15 C

AIRCRAFT - AH-1G

		AIR SPEED IN KTS						
		40	60	80	100	120	140	160
DRAG IN SQUARE FEET	5.0	1	4	9	17	31	57	91
	10.0	2	7	17	34	64	116	190

TABLE 4-36

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 4000 FT TEMPERATURE: 35 C

AIRCRAFT - AH-1G

		AIR SPEED IN KTS						
		40	60	80	100	120	140	160
DRAG IN SQUARE FEET	5.0	1	3	8	16	28	50	83
	10.0	2	6	16	32	57	102	167

TABLE 4-37

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG
PRESSURE: 6000 FT TEMPERATURE: -25 C
AIRCRAFT - AH-1G

		AIR SPEED IN KTS						
		40	60	80	100	120	140	160
DRAG IN SQUARE FEET	5.0	1	4	9	20	38	66	103
	10.0	2	8	19	40	78	136	215

TABLE 4-38

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG
PRESSURE: 6000 FT TEMPERATURE: -5 C
AIRCRAFT - AH-1G

		AIR SPEED IN KTS						
		40	60	80	100	120	140	160
DRAG IN SQUARE FEET	5.0	1	4	9	17	33	60	99
	10.0	2	7	17	35	67	119	199

TABLE 4-39

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 6000 FT TEMPERATURE: 15 C

AIRCRAFT - AH-1G

		AIR SPEED IN KTS						
		40	60	80	100	120	140	160
DRAG IN SQUARE FEET	5.0	1	3	8	16	29	53	86
	10.0	2	7	16	32	60	109	178

TABLE 4-40

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 6000 FT TEMPERATURE: 35 C

AIRCRAFT - AH-1G

		AIR SPEED IN KTS						
		40	60	80	100	120	140	160
DRAG IN SQUARE FEET	5.0	1	3	7	15	26	47	77
	10.0	2	6	15	29	53	96	156

TABLE 4-41

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 8000 FT TEMPERATURE: -25 C

AIRCRAFT - AH-1G

		AIR SPEED IN KTS						
		40	60	80	100	120	140	160
DRAG IN SQUARE FEET	5.0	1	4	9	18	36	62	100
	10.0	2	7	18	37	73	129	199

TABLE 4-42

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 8000 FT TEMPERATURE: -5 C

AIRCRAFT - AH-1G

		AIR SPEED IN KTS						
		40	60	80	100	120	140	160
DRAG IN SQUARE FEET	5.0	1	3	8	16	31	55	92
	10.0	2	7	16	33	63	110	184

TABLE 4-43

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 8000 FT TEMPERATURE: 15 C

AIRCRAFT - AH-1G

		AIR SPEED IN KTS						
		40	60	80	100	120	140	160
DRAG IN SQUARE FEET	5.0	1	3	7	15	27	50	81
	10.0	2	6	15	30	56	102	167

TABLE 4-44

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 8000 FT TEMPERATURE: 35 C

AIRCRAFT - AH-1G

		AIR SPEED IN KTS						
		40	60	80	100	120	140	160
DRAG IN SQUARE FEET	5.0	1	3	7	14	25	44	71
	10.0	2	6	14	27	50	90	146

TABLE 4-45

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG
PRESSURE: 10000 FT TEMPERATURE: -25 C
AIRCRAFT - AH-1G

		AIR SPEED IN KTS						
		40	60	80	100	120	140	160
DRAG IN SQUARE FEET	5.0	1	3	8	17	33	60	92
	10.0	2	7	17	35	68	121	184

TABLE 4-46

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG
PRESSURE: 10000 FT TEMPERATURE: -5 C
AIRCRAFT - AH-1G

		AIR SPEED IN KTS						
		40	60	80	100	120	140	160
DRAG IN SQUARE FEET	5.0	1	3	7	15	29	51	86
	10.0	2	6	15	31	59	103	171

TABLE 4-47

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG
PRESSURE: 10000 FT TEMPERATURE: 15 C
AIRCRAFT - AH-1G

		AIR SPEED IN KTS						
		40	60	80	100	120	140	160
DRAG IN SQUARE FEET	5.0	1	3	7	14	26	47	77
	10.0	2	6	14	28	52	95	157

TABLE 4-48

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 10000 FT TEMPERATURE: 35 C

AIRCRAFT - AH-1G

		AIR SPEED IN KTS						
		40	60	80	100	120	140	160
DRAG IN SQUARE FEET	5.0	1	3	6	13	23	41	66
	10.0	2	5	13	26	48	85	138

GROUND IDLE FUEL FLOW DATA

TABLE

TABLE 4-49

GROUND IDLE FUEL FLOW

AIRCRAFT - AH-1G

		PRESSURE ALTITUDE (FT)					
		SEA LEVEL	2000	4000	6000	8000	10000
TEMPERATURE DEGREES CENTIGRADE	-25 C	389	371	353	336	318	300
	-5 C	391	373	355	337	319	301
	15 C	391	374	356	338	321	303
	35 C	392	375	358	341	324	307

ENTRIES ARE AIRCRAFT FUEL FLOW RATES IN LBS/HR

GROSS WEIGHT LIMITS DATA

TABLES

TABLE 4-50

GROSS WEIGHT LIMITS
(DUE TO ENGINE)
FOR TAKEOFF CRITERIA #1
100% OF MAXIMUM POWER (HOGE)
AIRCRAFT - AH-1G

		PRESSURE ALTITUDE (FT)					
		SEA LEVEL	2000	4000	6000	8000	10000
TEMPERATURE DEGREES CENTIGRADE	-25 C	13521	12582	11704	10856	10063	9322
	-5 C	12128	11275	10440	9699	8958	8561
	15 C	10514	9762	9019	8338	7708	7038
	35 C	8766	8143	7530	6942	6394	5908

ENTRIES ARE AIRCRAFT GROSS WEIGHTS IN LBS

STRUCTURAL GROSS WEIGHT LIMIT: 9,500 LBS

TABLE 4-51

GROSS WEIGHT LIMITS
(DUE TO TRANSMISSION)
FOR TAKEOFF CRITERIA #1
100% OF MAXIMUM POWER (HOGE)
AIRCRAFT - AH-1G

		PRESSURE ALTITUDE (FT)					
		SEA LEVEL	2000	4000	6000	8000	10000
TEMPERATURE DEGREES CENTIGRADE	-25 C	9820	9632	9440	9251	8061	8865
	-5 C	9618	9431	9245	9058	8866	8660
	15 C	9433	9250	9066	8877	8676	8449
	35 C	9264	9083	8897	8700	8481	8229

ENTRIES ARE AIRCRAFT GROSS WEIGHTS IN LBS

STRUCTURAL GROSS WEIGHT LIMIT: 9,500 LBS

TABLE 4-52

GROSS WEIGHT LIMITS
(DUE TO ENGINE)
FOR TAKEOFF CRITERIA #2
95% OF RATED POWER. VERTICAL RATE OF CLIMB 450 FT/MIN. OGE
AIRCRAFT - AH-1G

		PRESSURE ALTITUDE (FT)					
		SEA LEVEL	2000	4000	6000	8000	10000
TEMPERATURE DEGREES CENTIGRADE	-25 C	1244	1584	10777	9996	9266	8584
	-5 C	11141	10358	9589	8910	8227	7617
	15 C	9632	8943	8261	7637	7059	6444
	35 C	8011	7442	6880	6341	5839	5395

ENTRIES ARE AIRCRAFT GROSS WEIGHTS IN LBS

STRUCTURAL GROSS WEIGHT LIMIT: 9,500 LBS

TABLE 4-5?

GROSS WEIGHT LIMITS
(DUE TO TRANSMISSION)
FOR TAKEOFF CRITERIA #2
TRANSMISSION POWER LIMIT. VERTICAL RATE OF CLIMB 450 FT/MIN. OGE
AIRCRAFT - AH-1G

		PRESSURE ALTITUDE (FT)					
		SEA LEVEL	2000	4000	6000	8000	10000
TEMPERATURE DEGREES CENTIGRADE	-25 C	9289	9134	8966	8755	8625	8453
	-5 C	9122	8957	8789	8622	8453	8278
	15 C	8959	8793	8629	8463	8291	8105
	35 C	8806	8644	8480	8311	8131	7925

ENTRIES ARE AIRCRAFT GROSS WEIGHTS IN LBS

STRUCTURAL GROSS WEIGHT LIMIT: 9,500 LBS

TABLE 4-54

GROSS WEIGHT LIMITS
(DUE TO ENGINE)
FOR TAKEOFF CRITERIA #3
100% OF MAXIMUM POWER (HIGE)
AIRCRAFT - AH-1G

		PRESSURE ALTITUDE (FT)					
		SEA LEVEL	2000	4000	6000	8000	10000
TEMPERATURE DEGREES CENTIGRADE	-25 C	15549	14470	13461	12486	11573	10721
	-5 C	13937	12957	11997	11146	10294	9540
	15 C	12083	11219	10366	9583	8859	8090
	35 C	10076	9360	8655	7978	7347	6789

ENTRIES ARE AIRCRAFT GROSS WEIGHTS IN LBS

STRUCTURAL GROSS WEIGHT LIMIT: 9,500 LBS

TABLE 4-55

GROSS WEIGHT LIMITS
(DUE TO TRANSMISSION)
FOR TAKEOFF CRITERIA #3
100% OF MAXIMUM POWER (HIGE)
AIRCRAFT - AH-1G

		PRESSURE ALTITUDE (FT)					
		SEA LEVEL	2000	4000	6000	8000	10000
TEMPERATURE DEGREES CENTIGRADE	-25 C	11266	11060	10851	10638	10415	10190
	-5 C	11047	10840	10628	10411	10188	9957
	15 C	10843	10634	10420	10200	9973	9730
	35 C	10650	10440	10223	10000	9762	9504

ENTRIES ARE AIRCRAFT GROSS WEIGHTS IN LBS

STRUCTURAL GROSS WEIGHT LIMIT: 9,500 LBS

VELOCITY LIMITS DATA

TABLES

TABLE 4-56

VELOCITY LIMITS TABLE
(INCLUDING FUEL FLOW RATES)
PRESSURE: SEA LEVEL TEMPERATURE: -25 C
AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	LONG RANGE		MAX CONTINUOUS POWER		MAX POWER (ENGINE)		TRANSMISSION LIMITS		VELOCITY NEVER EXCEED	
	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)
6,500	124	666	157	1045	158	1057	134	739	167	1217
7,000	124	673	156	1045	156	1057	133	739	167	1245
7,500	124	680	154	1045	155	1057	132	739	167	1274
8,000	124	687	153	1045	154	1057	130	739	167	1301
8,500	123	693	152	1045	152	1057	129	739	167	1328
9,000	123	701	150	1045	151	1057	127	739	167	1356
9,500	122	710	149	1045	149	1057	125	739	167	1388

TABLE 4-57

VELOCITY LIMITS TABLE
(INCLUDING FUEL FLOW RATES)
PRESSURE: SEA LEVEL TEMPERATURE: -5 C
AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	LONG RANGE		MAX CONTINUOUS POWER		MAX POWER (ENGINE)		TRANSMISSION LIMITS		VELOCITY NEVER EXCEED	
	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)
6,500	131	668	156	903	160	953	141	747	174	1132
7,000	130	674	155	903	159	953	140	747	174	1156
7,500	129	674	154	903	157	953	139	747	174	1178
8,000	128	676	152	903	156	953	137	747	174	1197
8,500	127	679	151	903	155	953	138	747	174	1216
9,000	126	685	149	903	153	953	134	747	174	1240
9,500	125	695	148	903	152	953	133	747	174	1274

TABLE 4-58

VELOCITY LIMITS TABLE
(INCLUDING FUEL FLOW RATES)
PRESSURE: SEA LEVEL TEMPERATURE: 15 C
AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	LONG RANGE		MAX CONTINUOUS POWER		MAX POWER (ENGINE)		TRANSMISSION LIMITS		VELOCITY NEVER EXCEED	
	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)
6,500	134	667	150	787	155	841	146	755	180	1105
7,000	134	673	149	787	154	841	145	755	180	1116
7,500	134	679	148	787	153	841	144	755	180	1124
8,000	133	683	146	787	152	841	143	755	180	1133
8,500	132	689	145	787	151	841	141	755	180	1150
9,000	132	700	143	787	149	841	139	755	180	1179
9,500	132	714	141	787	147	841	137	755	180	1233

TABLE 4-59

VELOCITY LIMITS TABLE
(INCLUDING FUEL FLOW RATES)
PRESSURE: SEA LEVEL TEMPERATURE: 35 C
AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	LONG RANGE		MAX CONTINUOUS POWER		MAX POWER (ENGINE)		TRANSMISSION LIMITS		VELOCITY NEVER EXCEED	
	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)
6,500	141	673	142	681	148	726	153	763	186	1044
7,000	140	678	141	681	148	726	152	763	186	1045
7,500	140	684	139	681	146	726	151	763	186	1047
8,000	140	692	138	681	145	726	150	763	186	1057
8,500	140	705	136	681	143	726	148	763	186	1084
9,000	140	721	134	681	141	726	146	763	186	1135
9,500	140	739	131	681	139	726	144	763	186	1213

TABLE 4-60

VELOCITY LIMITS TABLE
(INCLUDING FUEL FLOW RATES)
PRESSURE: 2000 FT TEMPERATURE: -25 C
AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	LONG RANGE		MAX CONTINUOUS POWER		MAX POWER (ENGINE)		TRANSMISSION LIMITS		VELOCITY NEVER EXCEED	
	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)
6,500	124	625	155	966	156	984	137	725	173	1257
7,000	124	633	154	966	155	984	136	725	173	1289
7,500	123	639	153	966	154	984	134	725	173	1319
8,000	123	646	151	966	152	984	133	725	173	1346
8,500	122	654	150	966	151	984	131	725	173	1376
9,000	122	663	148	966	149	984	129	725	173	1411
9,500	121	669	146	966	147	984	127	725	173	1457

TABLE 4-61

VELOCITY LIMITS TABLE
(INCLUDING FUEL FLOW RATES)
PRESSURE: 2000 FT TEMPERATURE: -5 C
AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	LONG RANGE		MAX CONTINUOUS POWER		MAX POWER (ENGINE)		TRANSMISSION LIMITS		VELOCITY NEVER EXCEED	
	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)
6,500	130	627	155	841	159	886	144	732	180	1155
7,000	129	627	154	841	157	886	143	732	180	1180
7,500	128	628	152	841	156	886	142	732	180	1199
8,000	127	632	151	841	155	886	140	732	180	1219
8,500	126	639	149	841	153	886	138	732	180	1247
9,000	125	650	147	841	151	886	136	732	180	1289
9,500	125	665	145	841	149	886	134	732	180	1350

TABLE 4-62

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 2000 FT TEMPERATURE: 15 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	LONG RANGE		MAX CONTINUOUS POWER		MAX POWER (ENGINE)		TRANSMISSION LIMITS		VELOCITY NEVER EXCEED	
	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)
6,500	134	626	149	731	154	781	150	739	187	1109
7,000	134	632	148	731	153	781	148	739	187	1116
7,500	133	635	146	731	152	781	147	739	187	1125
8,000	132	642	144	731	150	781	145	739	187	1143
8,500	132	654	142	731	148	781	143	739	187	1180
9,000	132	670	140	731	146	781	141	739	187	1252
9,500	132	690	137	731	143	781	138	739	187	1353

TABLE 4-63

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 2000 FT TEMPERATURE: 35 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	LONG RANGE		MAX CONTINUOUS POWER		MAX POWER (ENGINE)		TRANSMISSION LIMITS		VELOCITY NEVER EXCEED	
	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)
6,500	140	630	140	630	147	675	157	746	177	901
7,000	140	636	139	630	146	675	156	746	177	905
7,500	140	644	137	630	145	675	155	746	177	916
8,000	140	659	135	630	143	675	153	746	177	941
8,500	140	675	132	630	140	675	151	746	177	987
9,000	140	693	129	630	137	675	148	746	177	1059
9,500	139	705	125	630	134	675	144	746	177	1158

TABLE 4-64

VELOCITY LIMITS TABLE
(INCLUDING FUEL FLOW RATES)
PRESSURE: 4000 FT TEMPERATURE: -25 C
AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	LONG RANGE		MAX CONTINUOUS POWER		MAX POWER (ENGINE)		TRANSMISSION LIMITS		VELOCITY NEVER EXCEED	
	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)
6,500	124	588	154	892	155	916	139	713	180	1297
7,000	123	594	152	892	154	916	138	713	180	1329
7,500	123	601	151	892	152	916	136	713	180	1359
8,000	122	610	149	892	150	916	134	713	180	1390
8,500	122	618	142	892	146	916	148	713	180	1430
9,000	120	625	145	892	147	916	130	713	180	1485
9,500	116	621	143	892	144	916	128	713	180	1559

TABLE 4-65

VELOCITY LIMITS TABLE
(INCLUDING FUEL FLOW RATES)
PRESSURE: 4000 FT TEMPERATURE: -5 C
AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	LONG RANGE		MAX CONTINUOUS POWER		MAX POWER (ENGINE)		TRANSMISSION LIMITS		VELOCITY NEVER EXCEED	
	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)
6,500	129	582	154	782	157	820	147	719	187	1177
7,000	128	584	152	782	156	820	146	719	187	1198
7,500	127	588	151	782	154	820	144	719	187	1218
8,000	126	596	149	782	152	820	142	719	187	1250
8,500	125	608	147	782	150	820	140	719	187	1302
9,000	125	624	144	782	148	820	138	719	187	1380
9,500	125	645	142	782	145	820	135	719	187	1487

TABLE 4-66

VELOCITY LIMITS TABLE
(INCLUDING FUEL FLOW RATES)
PRESSURE: 4000 FT TEMPERATURE: 15 C
AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	LONG RANGE		MAX CONTINUOUS POWER		MAX POWER (ENGINE)		TRANSMISSION LIMITS		VELOCITY NEVER EXCEED	
	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)
6,500	134	587	147	677	153	721	153	725	176	933
7,000	133	590	146	677	151	721	152	725	176	943
7,500	132	599	144	677	149	721	150	725	176	963
8,000	132	611	142	677	147	721	148	725	176	999
8,500	132	627	139	677	145	721	145	725	176	1063
9,000	131	646	136	677	142	721	142	725	176	1152
9,500	131	669	132	677	138	721	139	725	176	1267

TABLE 4-67

VELOCITY LIMITS TABLE
(INCLUDING FUEL FLOW RATES)
PRESSURE: 4000 FT TEMPERATURE: 35 C
AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	LONG RANGE		MAX CONTINUOUS POWER		MAX POWER (ENGINE)		TRANSMISSION LIMITS		VELOCITY NEVER EXCEED	
	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)
6,500	140	591	138	582	146	624	162	731	163	736
7,000	140	599	136	582	144	624	160	731	163	748
7,500	140	614	134	582	142	624	158	731	163	768
8,000	140	631	131	582	139	624	155	731	163	801
8,500	140	648	127	582	136	624	151	731	163	849
9,000	137	657	122	582	132	624	147	731	163	919
9,500	134	671	114	582	127	624	143	731	163	1027

TABLE 4-68

VELOCITY LIMITS TABLE
(INCLUDING FUEL FLOW RATES)
PRESSURE: 6000 FT TEMPERATURE: -25 C
AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	LONG RANGE		MAX CONTINUOUS POWER		MAX POWER (ENGINE)		TRANSMISSION LIMITS		VELOCITY NEVER EXCEED	
	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)
6,500	123	551	152	825	154	849	142	700	187	1334
7,000	123	558	150	825	152	849	140	700	187	1365
7,500	122	567	148	825	150	849	138	700	187	1399
8,000	121	574	146	825	148	849	136	700	187	1444
8,500	119	579	144	825	146	849	134	700	187	1510
9,000	116	579	142	825	143	849	131	700	187	1602
9,500	114	593	139	825	141	849	128	700	187	1724

TABLE 4-69

VELOCITY LIMITS TABLE
(INCLUDING FUEL FLOW RATES)
PRESSURE: 6000 FT TEMPERATURE: -5 C
AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	LONG RANGE		MAX CONTINUOUS POWER		MAX POWER (ENGINE)		TRANSMISSION LIMITS		VELOCITY NEVER EXCEED	
	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)
6,500	128	542	152	725	156	762	150	707	175	983
7,000	126	546	150	725	154	762	148	707	175	1003
7,500	126	554	148	725	152	762	146	707	175	1039
8,000	125	567	146	725	150	762	144	707	175	1061
8,500	125	585	143	725	147	762	141	707	175	1151
9,000	125	608	140	725	144	762	138	707	175	1245
9,500	125	632	137	725	140	762	135	707	175	1368

TABLE 4-70

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 6000 FT TEMPERATURE: 15 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	LONG RANGE		MAX CONTINUOUS POWER		MAX POWER (ENGINE)		TRANSMISSION LIMITS		VELOCITY NEVER EXCEED	
	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)
6,500	133	548	146	628	151	667	157	713	161	747
7,000	132	556	144	628	149	667	155	713	161	763
7,500	132	569	141	628	147	667	152	713	161	790
8,000	132	587	138	628	144	667	149	713	161	833
8,500	131	606	135	628	140	667	146	713	161	895
9,000	131	631	131	628	136	667	142	713	161	978
9,500	130	659	125	628	131	667	137	713	161	1098

TABLE 4-71

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 6000 FT TEMPERATURE: 35 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	LONG RANGE		MAX CONTINUOUS POWER		MAX POWER (ENGINE)		TRANSMISSION LIMITS		VELOCITY NEVER EXCEED	
	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)
6,500	140	556	136	539	143	576	166	718	146	593
7,000	140	571	133	539	141	576	183	718	146	606
7,500	140	588	130	539	138	576	159	718	146	623
8,000	140	606	126	539	134	576	155	718	146	648
8,500	136	612	120	539	130	576	150	718	146	664
9,000	134	633	111	539	123	576	145	718	146	740
9,500	131	673	94	539	111	576	137	718	146	831

TABLE 4-72

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 8000 FT TEMPERATURE: -25 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	LONG RANGE		MAX CONTINUOUS POWER		MAX POWER (ENGINE)		TRANSMISSION LIMITS		VELOCITY NEVER EXCEED	
	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)
6,500	123	517	150	760	152	787	144	690	176	1117
7,000	122	527	148	760	150	787	142	690	176	1149
7,500	121	533	146	760	148	787	140	690	176	1192
8,000	118	535	143	760	145	787	137	690	176	1252
8,500	115	540	140	760	142	787	134	690	176	1335
9,000	114	559	137	760	139	787	131	690	176	1445
9,500	114	590	134	760	136	787	127	690	176	1582

TABLE 4-73

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 8000 FT TEMPERATURE: -5 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	LONG RANGE		MAX CONTINUOUS POWER		MAX POWER (ENGINE)		TRANSMISSION LIMITS		VELOCITY NEVER EXCEED	
	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)
6,500	126	506	150	669	154	703	153	695	160	769
7,000	126	515	148	669	152	703	151	695	160	794
7,500	125	528	145	669	149	703	148	695	160	831
8,000	125	547	142	669	146	703	145	695	160	801
8,500	125	571	139	669	142	703	142	695	160	949
9,000	124	597	135	669	139	703	138	695	160	1038
9,500	124	630	130	669	134	703	133	695	160	1166

TABLE 4-74

VELOCITY LIMITS TABLE
(INCLUDING FUEL FLOW RATES)
PRESSURE: 8000 FT TEMPERATURE: 15 C
AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	LONG RANGE		MAX CONTINUOUS POWER		MAX POWER (ENGINE)		TRANSMISSION LIMITS		VELOCITY NEVER EXCEED	
	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)
6,500	132	516	143	581	149	616	160	700	144	588
7,000	132	529	141	581	146	616	157	700	144	605
7,500	132	547	138	581	143	616	153	700	144	627
8,000	131	567	134	581	139	616	149	700	144	656
8,500	131	593	129	581	134	616	145	700	144	697
9,000	128	617	122	581	128	616	139	700	144	760
9,500	125	658	111	581	118	616	131	700	144	867

TABLE 4-75

VELOCITY LIMITS TABLE
(INCLUDING FUEL FLOW RATES)
PRESSURE: 8000 FT TEMPERATURE: 35 C
AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	LONG RANGE		MAX CONTINUOUS POWER		MAX POWER (ENGINE)		TRANSMISSION LIMITS		VELOCITY NEVER EXCEED	
	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)
6,500	140	529	134	501	140	531	169	705	129	483
7,000	140	547	130	501	137	531	163	705	129	497
7,500	139	562	125	501	133	531	158	705	129	516
8,000	135	570	118	501	128	531	152	705	129	539
8,500	133	599	109	501	118	531	146	705	129	575
9,000	127	631	91	501	104	531	137	705	129	641
9,500	123	696	0	501	0	531	125	705	129	744

TABLE 4-76

VELOCITY LIMITS TABLE
(INCLUDING FUEL FLOW RATES)
PRESSURE: 10000 FT TEMPERATURE: -25 C
AIRCRAFT - AH-1G

	LONG RANGE		MAX CONTINUOUS POWER		MAX POWER (ENGINE)		TRANSMISSION LIMITS		VELOCITY NEVER EXCEED	
GROSS WEIGHTS (LBS)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)
6,500	122	488	147	699	150	729	146	684	160	863
7,000	121	495	145	699	147	729	144	684	160	898
7,500	117	494	142	699	145	729	141	684	160	945
8,000	114	503	139	699	142	729	138	684	160	1006
8,500	114	527	136	699	138	729	134	684	160	1086
9,000	114	562	132	699	134	729	130	684	160	1187
9,500	114	602	127	699	130	729	125	684	160	1327

TABLE 4-77

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 10000 FT TEMPERATURE: -5 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	LONG RANGE		MAX CONTINUOUS POWER		MAX POWER (ENGINE)		TRANSMISSION LIMITS		VELOCITY NEVER EXCEED	
	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HP)
6,500	125	477	147	616	154	677	155	687	143	584
7,000	125	491	145	616	151	677	152	687	143	606
7,500	125	511	141	616	148	677	149	687	143	633
8,000	125	535	137	616	144	677	145	687	143	669
8,500	124	563	133	616	140	677	140	687	143	720
9,000	123	600	126	616	134	677	135	687	143	794
9,500	121	647	117	616	125	677	126	687	143	908

TABLE 4-78

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 10000 FT TEMPERATURE: 15 C

AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	LONG RANGE		MAX CONTINUOUS POWER		MAX POWER (ENGINE)		TRANSMISSION LIMITS		VELOCITY NEVER EXCEED	
	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)
6,500	132	490	141	537	145	562	162	690	127	468
7,000	132	509	137	537	141	562	157	690	127	486
7,500	131	530	132	537	137	562	153	690	127	508
8,000	130	556	127	537	132	562	147	690	127	536
8,500	126	581	118	537	123	562	141	690	127	581
9,000	124	634	104	537	111	562	131	690	127	654
9,500	119	698	71	537	90	562	118	690	127	769

TABLE 4-79

VELOCITY LIMITS TABLE
(INCLUDING FUEL FLOW RATES)
PRESSURE: 10000 FT TEMPERATURE: 35 C
AIRCRAFT - AH-1G

GROSS WEIGHTS (LBS)	LONG RANGE		MAX CONTINUOUS POWER		MAX POWER (ENGINE)		TRANSMISSION LIMITS		VELOCITY NEVER EXCEED	
	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)
6,500	140	507	130	464	137	491	169	694	110	410
7,000	139	521	125	464	132	491	161	694	110	426
7,500	135	531	116	464	126	491	155	694	110	448
8,000	133	568	108	464	114	491	148	694	110	480
8,500	125	598	0	464	93	491	137	694	110	530
9,000	122	682	0	464	0	491	124	694	110	610
9,500	115	1754	0	464	0	491	107	694	110	715

APPENDIX A

FUNCTIONS FOR CALCULATING BASIC FUEL FLOW

There are four functions that can be used to calculate the basic fuel flow for the AH-1G helicopter. In order to use the functions the following data is needed:

1. Flight Mode
2. Temperature
3. Pressure (altitude)
4. Gross weight

Which of the four functions will be used depends on the flight mode. The first function is for HIGE (Hover In Ground Effect).

$$FF\ (HIGE) = f\ (TEMP, ALT, GW)$$

The second function is for HOGE (Hover Out of Ground Effect).

$$FF\ (HOGE) = f\ (TEMP, ALT, GW)$$

The third function is for NOE (Nap of the Earth).

$$FF\ (NOE) = f\ (TEMP, ALT, GW)$$

The fourth function is for Forward Flight.

$$FF\ (Forward\ Flight) = f\ (AS, TEMP, ALT, GW)$$

The equation for FF (HIGE) is:

$$FF\ (HIGE) = A\ (ALT) + B\ (TEMP) + C\ (GW) + D\ (ALT)(TEMP) + E\ (ALT)\ (GW) + F\ (TEMP)\ (GW) + G\ (ALT)\ (TEMP)\ (GW) + K$$

Where ALT is the altitude, TEMP is the temperature and GW is the gross weight and the constants have the following values:

$A = -1.96834146 \times 10^{-2}$ $\quad$ $E = 2.00553615 \times 10^{-6}$

$B = 5.60695611 \times 10^{-1}$ $\quad$ $F = 3.3810197 \times 10^{-5}$

$C = 4.71104011 \times 10^{-2}$ $\quad$ $G = 9.69504943 \times 10^{-9}$

$D = -8.18767749 \times 10^{-5}$ $\quad$ $K = 2.0272612 \times 10^{2}$

The equation for FF (HOGE) is exactly the same form as FF (HIGE). A new set of values for the constants is used. These values are:

$A = -2.92590868 \times 10^{-2}$ $E = 3.54428155 \times 10^{-6}$

$B = 6.0189398 \times 10^{-2}$ $F = 9.28208174 \times 10^{-5}$

$C = 5.73833212 \times 10^{-2}$ $G = 2.65311797 \times 10^{-8}$

$D = -1.7872914 \times 10^{-4}$ $K = 1.82802254 \times 10^{2}$

The equation for FF (NOE) is once again the same as FF (HIGE). The new values for the constants are:

$A = -3.24970242 \times 10^{-2}$ $E = 3.60908763 \times 10^{-6}$

$B = 2.56689422 \times 10^{-1}$ $F = 3.79480189 \times 10^{-5}$

$C = 3.85965109 \times 10^{-2}$ $G = 4.78026205 \times 10^{-8}$

$D = -3.26023186 \times 10^{-4}$ $K = 2.71548943 \times 10^{2}$

For the Forward Flight modes the form of the equation is:

$$FF = A(AS) + B(AS^2) + C(AS^3) + D(TEMP) + E(GW) + F(ALT) + G(AS^3)(TEMP) + H(AS^2)(TEMP) + I(AS)(TEMP) + J(AS^3)(GW) + K(AS^2)(GW) + L(AS)(GW) + M(AS^3)(ALT) + N(AS^2)(ALT) + O(AS)(ALT) + P(TEMP)(GW) + Q(TEMP)(ALT) + R(GW)(ALT) + S(TEMP)(GW)(ALT) + T$$

Where AS is the air speed in kts and the values of the constants are:

$A = 1.37874198 \times 10$ $K = 1.45717754 \times 10^{-5}$

$B = -1.47026714 \times 10^{-1}$ $L = -1.70559436 \times 10^{-3}$

$C = 5.46789146 \times 10^{-4}$ $M = -1.16014476 \times 10^{-8}$

$D = 1.4382517$ $N = 3.26539885 \times 10^{-6}$

$E = 6.70538358 \times 10^{-2}$ $O = -3.30476261 \times 10^{-4}$

$F = -2.60242061 \times 10^{-2}$ $P = 2.1977321 \times 10^{-6}$

$G = -3.5558422 \times 10^{-6}$ $Q = -1.1703294 \times 10^{-4}$

$H = 6.2059176 \times 10^{-4}$ $R = 3.51456487 \times 10^{-6}$

$I = -4.42898646 \times 10^{-2}$ $S = 1.87051727 \times 10^{-8}$

$J = -3.18423465 \times 10^{-8}$ $T = 5.72344971$

These functions allow anyone with a simple calculator to figure the fuel flow of the aircraft and bypass both looking up the values and interpolating for points in between the data points in the tables.

The above equations calculate the basic fuel flow for the AH-1G helicopter with the following accuracies;

FF (HIGE) - 99.40%

FF (HOGE) - 98.82%

FF (NOE) - 97.28%

FF (Forward Flight) - 98.79%

APPENDIX B

FUNCTION FOR CALCULATING DELTA FUEL FLOW FOR DRAG

The function below will calculate the delta fuel flow for drag for the AH-1G helicopter. Recall from the discussion in chapter three that this value is added to the basic fuel flow value whenever drag is increasing the rate of fuel flow.*

In order to use the function the following data is needed:

1. Air Speed (AS)
2. Equivalent Square Footage of Drag (SQ)
3. Temperature (TEMP) in degrees centigrade
4. Altitude (ALT) in feet above sea level

That is:

$$FF\ (Drag) = f(AS, SQ, TEMP, ALT)$$

The equation for FF (Drag) is:

$$FF\ (Drag) = A(AS) + B(AS^2) + C(AS^3) + D(TEMP) + E(SQ) + F(ALT)$$
$$+ G(AS^3)(TEMP) + H(AS^2)(TEM) + I(AS)(TEMP) + J(AS^3)(SQ) + K(AS^2)(SQ)$$
$$+ L(AS)(SQ) + M(AS^3)(ALT) + N(AS^2)(ALT) + O(AS)(ALT) + P(TEMP)(SQ)$$
$$+ Q(TEMP)(ALT) + R(SQ)(ALT) + S(SQ)(ALT)(TEMP) + T$$

Where the constants have the following values:

$A = 4.24172938 \times 10^{-1}$	$K = -1.31866374 \times 10^{-3}$
$B = -5.50349837 \times 10^{-3}$	$L = 8.05206299 \times 10^{-2}$
$C = 2.69074524 \times 10^{-5}$	$M = -4.29214581 \times 10^{-9}$
$D = 1.76306169 \times 10^{-1}$	$N = 8.13154735 \times 10^{-7}$
$E = 2.42251158 \times 10^{-1}$	$O = -6.10293355 \times 10^{-5}$
$F = 3.06626523 \times 10^{-3}$	$P = -4.2081777 \times 10^{-2}$
$G = -1.6951897 \times 10^{-7}$	$Q = -1.57142867 \times 10^{-6}$
$H = -1.92432872 \times 10^{-5}$	$R = -2.26803666 \times 10^{-4}$
$I = 3.03757191 \times 10^{-3}$	$S = 1.54490282 \times 10^{-6}$
$J = 1.02981769 \times 10^{-5}$	$T = -1.95841799 \times 10$

There is no delta fuel flow for drag for HIGE, HOGE or NOE flight.

This equation calculates the delta fuel flow for drag value with an accuracy of 99.69%. It should be noted that in some instances the computed value will be negative. If this occurs, zero (Ø) should be used as the value for delta fuel flow.

APPENDIX C

FUNCTION FOR CALCULATING GROUND IDLE FUEL FLOW

The function below will calculate the ground idle fuel flow rate for the AH-1G helicopter. In order to use the function the following data is needed:

1. Temperature (TEMP) in degrees centigrade.
2. Altitude (ALT) in feet above sea level.

That is:

$$FF\ (Idle) = f\ (TEMP, ALT)$$

The equation, for FF (Idle) is:

$$FF\ (Idle) = A(TEMP) + B(ALT) + C(TEMP)(ALT) + D(TEMP^2) + E(ALT^2) + F$$

Where the constants have the following values:

$A = 4.31250222 \times 10^{-2}$ $\quad$ $D = 5.20833513 \times 10^{-4}$

$B = -8.81775992 \times 10^{-3}$ $\quad$ $E = -1.11681478 \times 10^{-9}$

$C = 6.49999595 \times 10^{-6}$ $\quad$ $F = 3.90269852 \times 10^{2}$

This equation calculates the ground idle fuel flow rate with an accuracy of 99.98%.

APPENDIX D

FUNCTIONS FOR CALCULATING GROSS WEIGHT LIMITS FOR TAKEOFF

The functions given below will calculate the gross weight limits for take off for the AH-1G helicopter. Each of the functions is of the same basic form with the values of the constants changing depending on which take off criteria is being used. In all cases the Structural Gross Weight Limit of the AH-1G helicopter is 9,500 lbs.

In order to use the functions the following data is needed:

1. Temperature (TEMP) in degrees centigrade

2. Altitude (ALT) in feet above sea level

That is:

GW (Limit) = f (TEMP, ALT)

The basic equation for GW (Limit) is:

GW (Limit) = A(TEMP) + B(ALT) + C(TEMP)(ALT) + D

For take off criteria #1 the equation must be used twice, once using the engine limit constants and once using the transmission limit constants. For take off criteria #1 the constants for engine limits are:

$A = -7.85507221 \times 10$ $\quad C = 2.08064428 \times 10^{-3}$

$B = -3.64956789 \times 10^{-1}$ $\quad D = 1.15476464 \times 10^{4}$

For take off criteria #1 the constants for transmission limits are:

$A = -8.88309515$ $\quad C = -1.1871431 \times 10^{-4}$

$B = -9.71135665 \times 10^{-2}$ $\quad D = 9.5892843 \times 10^{3}$

For take off criteria #2 two checks must also be made. The constants for engine limits, take off criteria #2 are:

$A = -7.32945299 \times 10$ $\quad C = 1.93157258 \times 10^{-3}$

$B = -3.34965002 \times 10^{-1}$ $\quad D = 1.06030083 \times 10^{4}$

For take off criteria #2 the constants for transmission limits are:

$A = -7.96285689$ $\quad C = -5.34286169 \times 10^{-5}$

$B = -8.48471383 \times 10^{-2}$ $\quad D = 9.09121887 \times 10^{3}$

Also for take off criteria #3 two checks must be made. The constants for engine limits, take off criteria #3 are:

$A = -9.03973799 \times 10$ $\quad C = 2.3901434 \times 10^{-3}$

$B = -4.19486418 \times 10^{-1}$ $\quad D = 1.32744985 \times 10^{4}$

For take off criteria #3 the constants for transmission limits are:

$A = -1.01152378 \times 10$ $\quad C = -1.08285753 \times 10^{-4}$

$B = -1.09844279 \times 10^{-1}$ $\quad D = 1.10136713 \times 10^{4}$

This equation with the various sets of constants gives results that are 99.67% accurate or better.

APPENDIX E

SHORT DESCRIPTION OF AH-1G DATA SOURCE

DRDAV-EQA(A)
SUBJECT: Short description of AH-1G performance data provided to TRADOC Systems Analysis Activity (TRASANA)

MFR:

1. References:

a. Engineering flight test, AH-1G Helicopter (Huey Cobra), Phase D, Part 2, final report. USAASTA Proj. No.66-06, Nov 1970.

b. Determination of the Effects of Rotor Blade Compassibility on the Performance of the UH-1F; FTC-TR-65-17

c. Letter, DRDAV-PDAO, To: Kaman Aerospace Corp. Subject: Contract DAAJ01-77-C-0317, Basic Data for Use in Preparation of K747-003 Blade, AH-1S (PROD) Operators Manual Performance Charts; 19 Aug 1977.

d. Operator's Manual, Army Model AH-1G Helicopter, TM55-1520-221-10, Dec. 75.

e. Operator's Manual, Army AH-1S (Prod) Helicopter, TM55-1520-236-10, Apr 77.

2. The performance data presented to TRASANA is the result of combining the helicopter power required, engine power available and engine fuel flow characteristics. The AH-1G, AH-1S (540 blades) and AH-1S (K747 blades) power required was calculated for the required altitude and temperature combinations from a non-dimensional representation of engine power required (coefficient of power) v.s. gross weight (coefficient of thrust) and true airspeed (advance ratio). The non-dimensional engine power required for the AH-1G and AH-1S (540 blades) was extracted from reference 1a. The drag difference accounted for between the AH-1G and AH-1S (540 blades), was +6.5 ft^2 equivalent flat plate area. This extra drag of the AH-1S (540 blades) accounts for +2.5 ft^2 due to the different nose configuration and +4 ft^2 due to the flat glass canopy configuration of the AH-1S. The non-dimensional engine power required for the AH-1S (K747 blades) was extracted from reference 1c. All performance in ground effect represents a 2 foot skid height. A temperature dependent correction, based on the method outlined in reference b., was made to the power required to account for compressibility which could not be accounted for in the non-dimensional representation.

3. The T53-L-13 engine power available to the AH-1G (which was used in combination with the power required to find helicopter take-off and speed limits) was used, as a function of altitude and temperature, from reference 1a. The T53-L-703 engine power available to the AH-1S (540 blades) and AH-1S (K747 blades) was calculated for the various altitude and temperature combinations, by the use of the Lycoming T53-L-703 engine specification computer program. Proper engine installation effects were taken into account.

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SUBJECT: Short description of AH-1G performance data provided to TRADOC Systems Analysis Activity (TRASANA)

4. The engine fuel flow at a particular altitude and temperature combination was derived from a representative referred fuel flow as a function of referred engine power. The referred fuel flow curve for the T53-L-13 engine (AH-1G), was taken from reference 1a. The referred fuel flow curve for the T53-L-703 engine (AH-1S) was constructed by use of the Lycoming T53-L-703 engine specification computer program which calculated fuel flows at various engine power levels and atmospheric conditions. The fuel flows were then corrected to reflect 5% conservatism. A referred parameter is one which is divided by temperature and pressure ratios in order to represent all atmospheric conditions by one function.

5. The never exceed speeds (Vn.e.) were calculated from those shown graphically in references 1d and 1e for the AH-1G and AH-1S respectively.

6. The Structural Gross Weight limit of the AH-1G is 9500 lbs. The Structural Gross Weight limit of the AH-1S is 10000 lbs.

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